DESCRIPTION OF TWO NEW AUSTRALIAN SMARIDIDAE (ACARINA), WITH REMARKS ON CHAETOTAXY AND GEOGRAPHICAL DISTRIBUTION

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SUMMARY

Two new Australian species of Smarididae (Acarina) are described, each from the adult and nymphal instars. These are *Smaris cooperi*, n. sp., from South Australia and Western Australia, and *Fessonia taylori*, n. sp., from New South Wales, thus increasing the known Australian fauna of each genus to two species. Distinguishing characters are given and some additional features of the chaetotaxy of the Smarididae described.

A coding system of general applicability for the chaetotaxy of these and other mites is given.

Comment is made upon the distribution of *Smaris* in Australia and elsewhere.

INTRODUCTION

Previously the genera *Smaris* Latreille, 1796, and *Fessonia* Heyden, 1826, have each contained one known Australian species, these being *Smaris prominens* (Banks, 1916) and *Fessonia australiensis* Southcott, 1946 (Womersley and Southcott (1941), Southcott (1946a, 1960)). In the present paper a further species of each genus will be described from Australia, these being *Smaris cooperi*, n. sp. from South Australia and Western Australia, and *Fessonia taylori*, n. sp. from New South Wales. The generic terms will be used in the sense of the author's (1961b) revision of the Erythraeoidea, and the descriptive terms will be as used there and in the author's study (1962) of the North American and other Smarididae.

DESCRIPTION OF A NEW SPECIES OF *SMARIS*

Smaris cooperi n. sp.

Figs. 1-6

Description of adult female (Figs. 1-5) (from the holotype ACA1733). Colour in life reddish. Animal of normal smaridid shape, with a slender nasus and with the idiosoma provided with sclerotized plates. Idiosoma 990μ long to tip of nasus, by 540μ wide where widest, at the "shoulders" at about the level of the midsensillary point of the crista.

Anterior dorsal scutum as figured (Figs. 1, 2, 3), with narrow anterior projection on to the nasus, and circular posterior part, the whole scutum thus pyriform in outline, 515μ long by 335μ wide, enclosing the eyes and sensillary areas. The anterior dorsal scutum has a slight ocular projection near the eyes on each side.

Eyes 2 + 2, each lateral pair arising from a lightly sclerotized ocular boss; anterior eye the larger, about 38μ across, directed anterolaterally, the posterior about 26μ across, directed posterolaterally. The ocular boss carries 7-8 normal dorsal idiosomalae (scobalae) and is placed near the edge of the scutum as figured (Fig. 2).

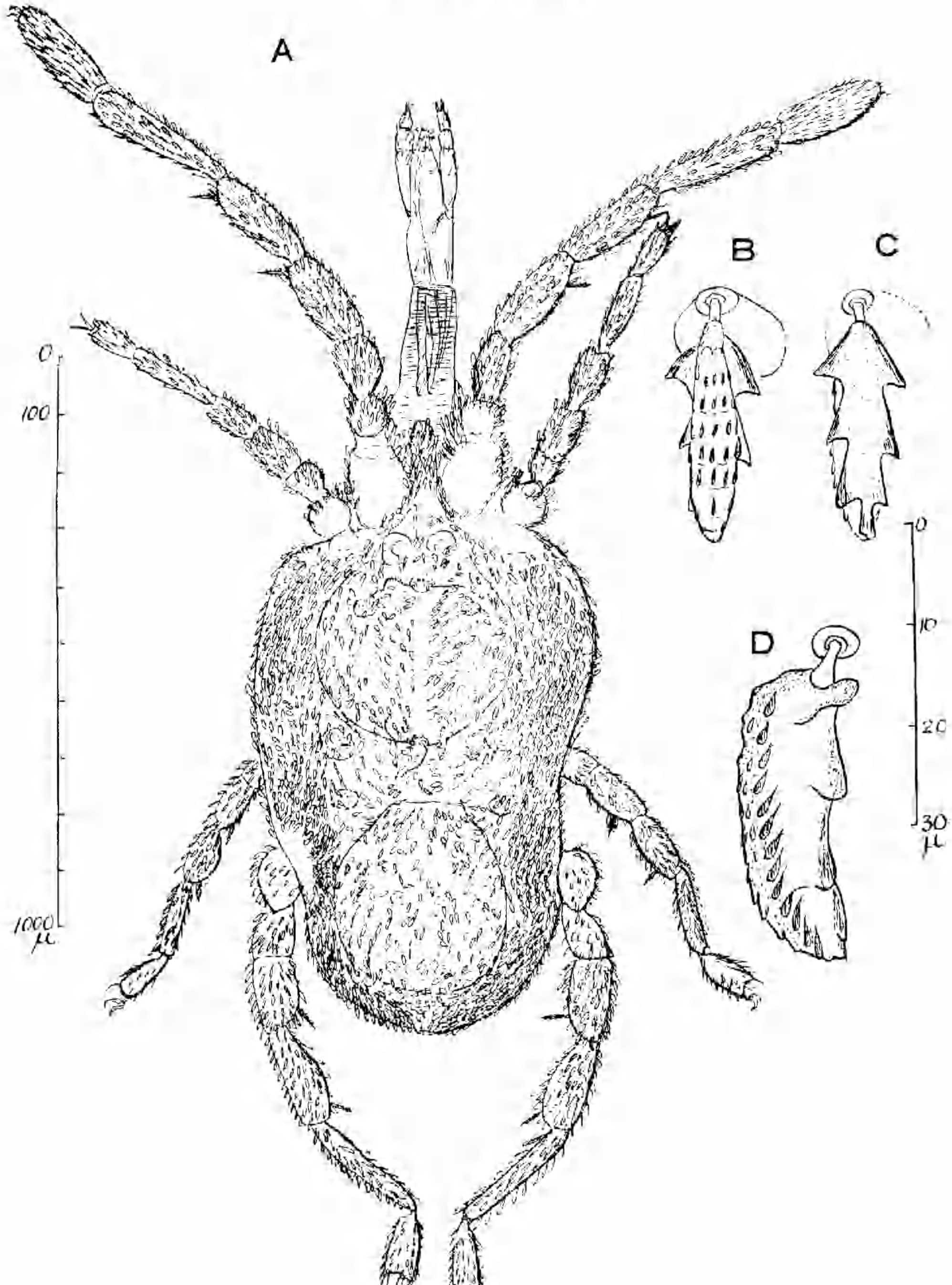

Fig. 1. *Smaris cooperi*, n. sp. Adult female (holotype). A, entire, dorsal view, to scale on left. B-D, views of dorsal idiosomalae, to scale on right; B, from above; C, same seta from below; D, lateral view of a large seta from near posterior pole of idiosoma.

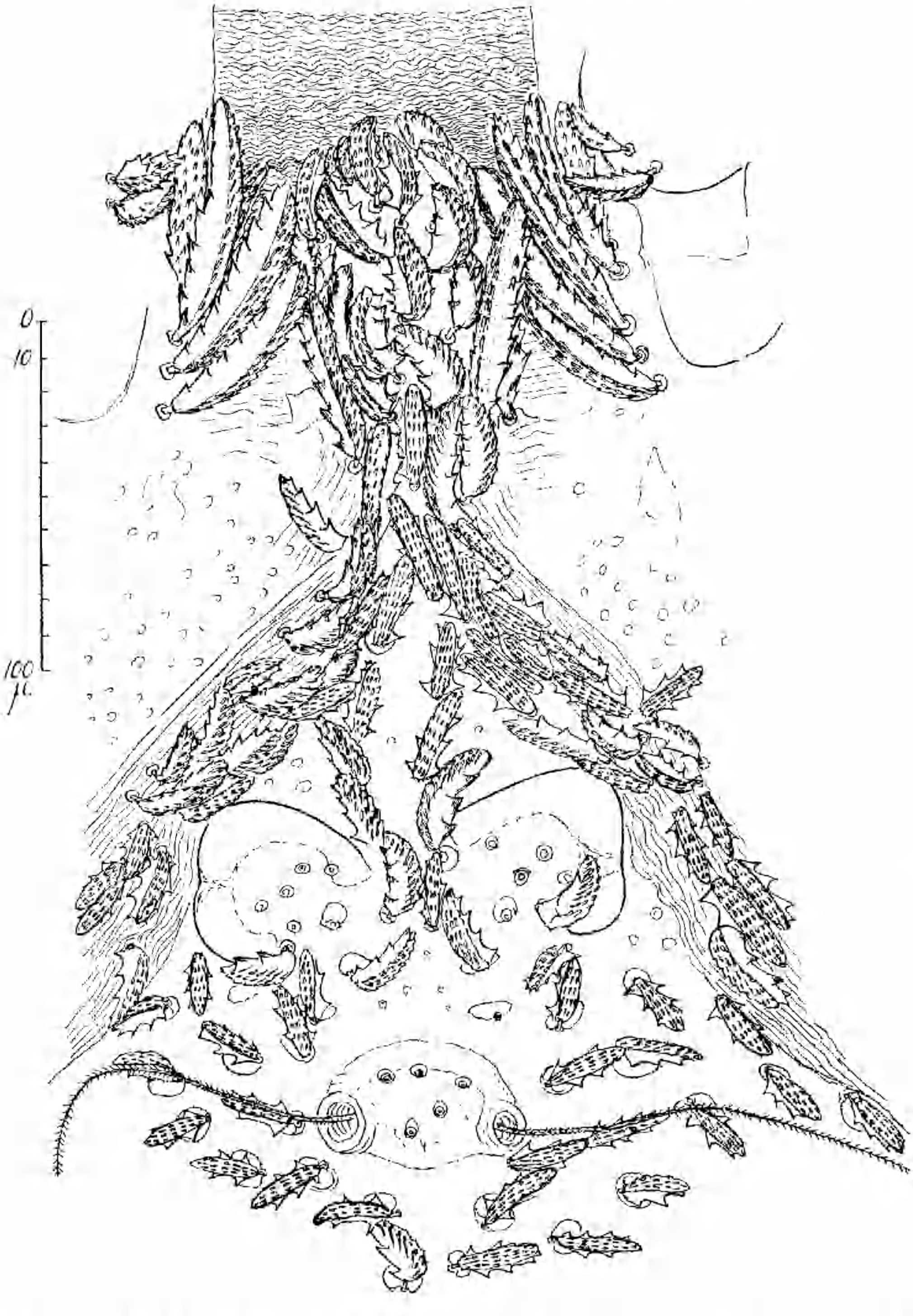

Fig. 2. *Smaris cooperi*, n. sp. Adult female (holotype). Dorsal view of propodosoma and adjacent structures.

Anterior sensillary boss lightly sclerotized, with 5 scobalae (ACA1733, 1734). Anterior sensillae slender, tapering, ciliated throughout, the ciliations small in proximal third, more distally the ciliations are longer, but over the distal half remain fairly constant in length and distribution. Posterior sensillary boss lightly sclerotized, without scobalae; posterior scutal sensillae similar

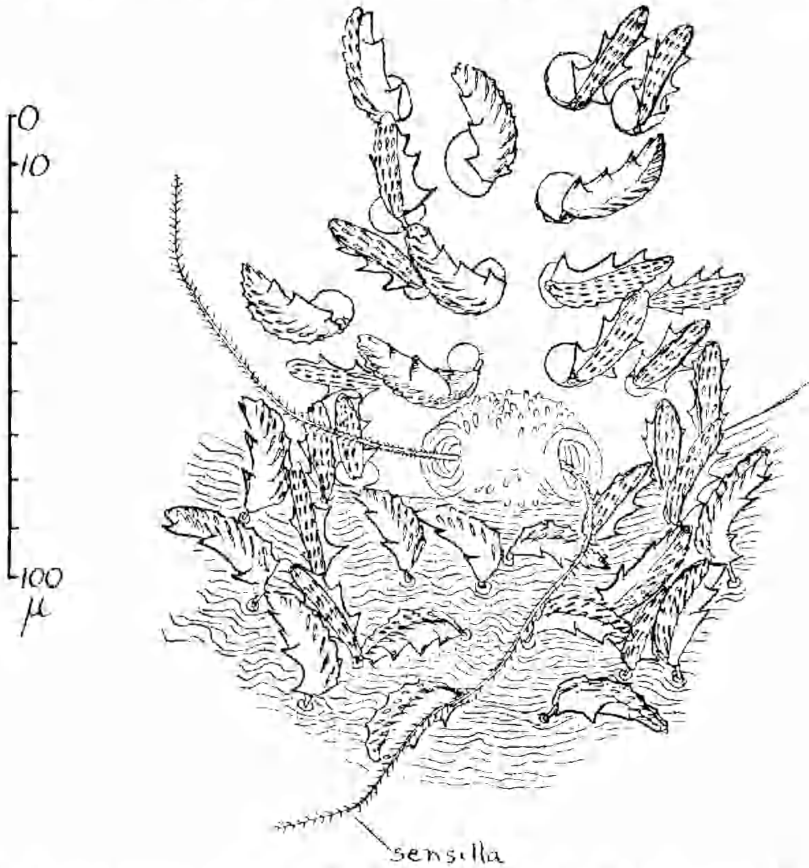

Fig. 3. *Smaris cooperi*, n. sp. Adult female (holotype). Posterior sensillary area of anterior dorsal scutum and adjacent structures.

to anterior sensillae. Scobalae of anterior dorsal scutum arise from the side of a circular or oval pit. In places among these are much smaller pits. Between the anterior and posterior sensillae there is a narrow strip of scutum devoid of seta-pits, and thus a crista is outlined upon the scutum.

The standard data of the type and paratype specimens are as follows:

	ASens	PSens	SBa	SBp	ISD	DS
Holotype ACA1733 (S. Aust.)	104	104	41	24	235	22-30
Paratype ACA1734 (S. Aust.)	ca. 100	ca. 115	44	25	280	20-32
Paratype ACA1737 (W. Aust.)	83	97	51	23	238	20-32

Posterior dorsal scutum of female large, elliptical, anterior margin a little flattened, 266μ long by 230μ wide.

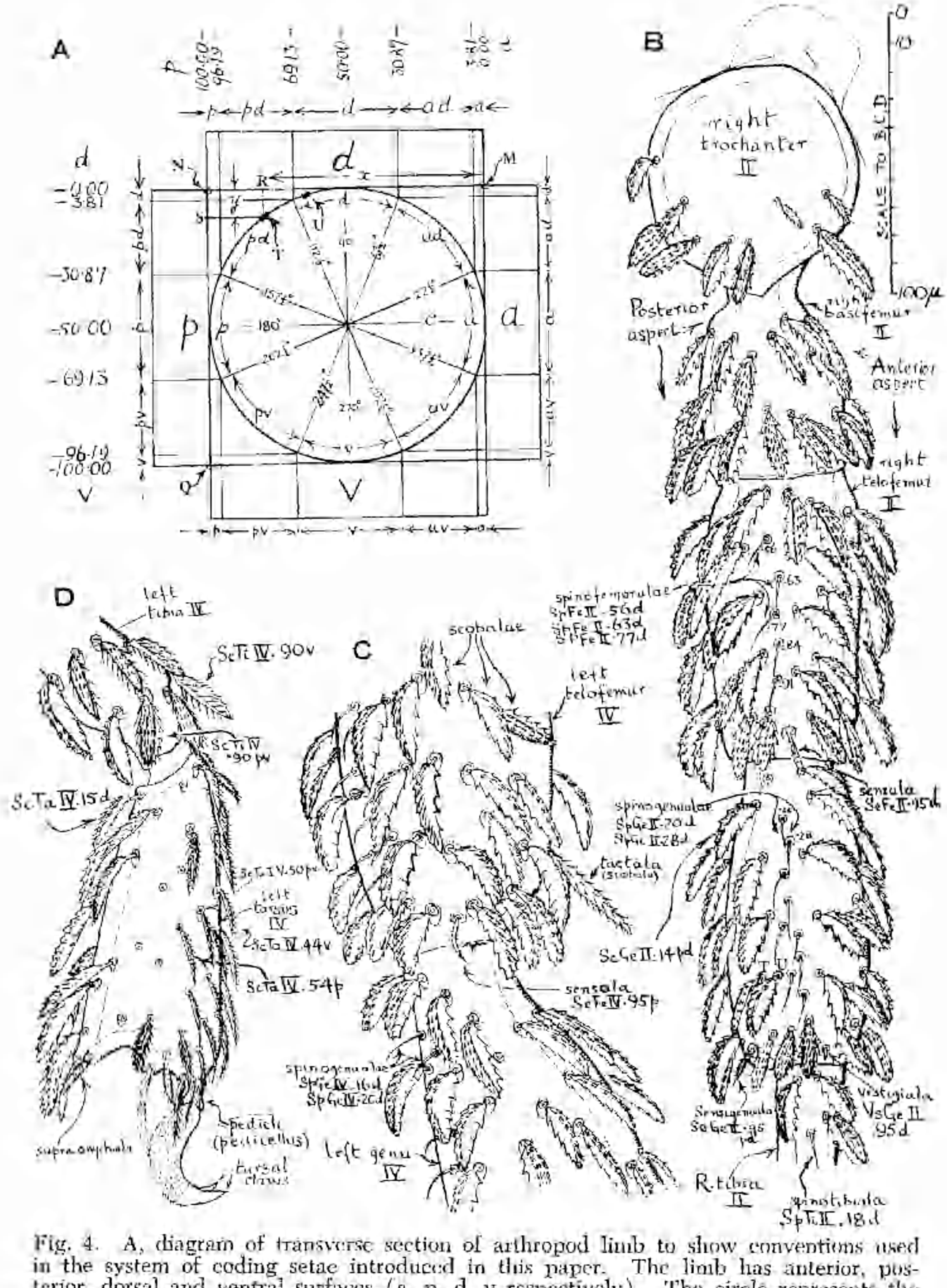

Fig. 4. A, diagram of transverse section of arthropod limb to show conventions used in the system of coding setae introduced in this paper. The limb has anterior, posterior, dorsal and ventral surfaces (a, p, d, v respectively). The circle represents the circumference of the section and is divided into 8 equal segments, a, ad, d, pd, ... respectively, and the projections of these upon vertical and horizontal tangential planes are shown. T and U represent the positions of setae T and U in Fig. 4 B. See text for further explanation. B-D, *Smaris cooperi*, n. sp. Adult female (holotype), parts of various limbs: B, proximal part of right leg II, from above; C, posterior surface of left leg IV, showing part of femur and genu; D, tip of left leg IV, posterior aspect, showing tarsus IV and part of tibia IV. Figs. B-D show the application of the chaetotaxic coding system, explained further in text.

Dorsal idiosomal setae (scobalae) have a dorsal flange or tectum setae that is fusiform or clavate and which has about 10 transverse rows of spicules, these tending also to form into longitudinal columns. The transverse rows have up to 5 or 6 spicules. The carinal flange expands into a wide plate, each lateral edge with 3-4 large serrations (see Fig. 1 B, C, D). The dorsal setae vary considerably in size. The posterior setae are large, as are also some near the ASens and anterior to the PSens. The scutal scobalae are mostly smaller than those from the striate cuticle (i.e. the non-scutal dorsal idiosomalae). Setae from the upper surface of coxae I are to 60μ long.

Venter normal for genus, external genitalia and anus normal. The more peripheral ventralae similar to dorsalae, but smaller and proportionally less elongate; the more central ventralae have the carinal serrations lengthened so that the setae tend to resemble the typical bushy smaridid central ventralae with long ciliations. Specialized scobalae of anus and external genitalia are like fir-cones with pointed bracts; setae of labial edges of genitalia ("labialae") pointed, slender, slightly ciliated with adnate ciliations, and many of the labialae are angled, resembling an angled dagger.

Legs normal; lengths (including trochanter to tips of tarsal claws): I 980μ, II 590μ, III 525μ, IV 850μ. Tarsus I 205μ long by 64μ across, tibia I 230μ long. Tarsus IV 119μ long by 50μ high, tibia IV 209μ, 217μ long. (Tarsal lengths exclusive of claws and pedicle.) Leg setae as figured, the distribution appearing normal (see Figs. 1, 4 B-D). Pedoscobalae similar to dorsal idiosomalae, but distally along the legs these setae become more elongate and pointed. Each pedoscobala has an ovoid depression surrounding the seta-base (annulus), with the acuter end pointing distally along the leg; this is a normal feature in adult, nymphal and larval Erythraeoidea, and is illustrated in Fig. 4 B, C for *S. cooperi* as well as in Fig. 7 J for *Fessonia taylori*. A vestigiala is present distally upon tibia II (see Fig. 4 B) (coding VsGeII.95d*).

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* This system of coding, here introduced, is based upon the classification of setae elaborated by the author (1961b) in his review of the Erythraeoidea, including chaetotaxy and other aspects. As used in this example, Vs = vestigiala, Ge = genu, II = leg II, ·95 indicates that this seta is found on a coordinate 95/100 along the length of the segment concerned, measuring distally between the two chitinous end-points, and d = dorsal. It is proposed to use similarly the following: Sc = scobala, Se = sensala, So = solenoidala, Ss = sensilla, St = seta of undefined type, Si = sinuala, Sx = supracoxala, Su = supraonychiala, Ta = tactala (scobala), Fa = famulus (famala), Cp = companala, for various types of setae; I-IV to indicate the legs; Pa for the palp; Cx = coxa, Tr = trochanter, Fe = femur, Ti = tibia, Ta = tarsus, for the limb segments; a = anterior, ad = anterodorsal, av = anteroventral, d = dorsal, p = posterior, pd = posterodorsal, pv = posteroventral, v = ventral, for position around the circumference of a transverse section of a limb segment; L = left, R = right. These terms and concepts are explained by the author (1961b) (except for sinuala, which is introduced in another paper (1961a)) where the subject is treated from an historical viewpoint. The system and code incorporate proposals and terms from other authors but the system of lettering proposed here is new, and may use letters in a different way from those used by other authors. It is hoped that this system of coding will provide a method of general availability among the Acarina, and will be simple to use. Various other examples of its use will be made in the present paper, particularly in Fig. 4 B-D.

Some further comment is necessary upon the use of the circumferential positions of setae. The circumference of a transverse section of a limb segment is treated as a circle, and divided into 8 segments, a, ad, d . . . (as shown in Fig. 4 A), each subtending an angle of 45° at the centre. The projections of these segments upon tangential planes is shown there, thus MN indicating the dorsal tangential plane. In general it will be found that in the erythraeoid leg, as well as for many other Acarina, the code as given in the example above will specify a single seta. In certain circumstances, e.g. where more than one seta answers to the coding, then it may be necessary to introduce a further specification and code symbol. Thus the radial coordinate suggested by the author (1961b) could be used, or some equivalent of it. Thus if the two setae labelled T and U upon genu II in Fig. 4 B were both coded ScGeII.71pd (actually U is coded ScGeII.71d, but this example

Sensalae of the legs: typical tromibiform-type spinalae are present upon the dorsal aspects of the telofemora, genua and tibiae (Fig. 4 B, C). The tarsi carry the supraonychialae and other modified setae as figured (Fig. 4 D). In addition to the normal spinalae the telofemur carries posterodorsally at its distal end a ciliated sensory seta which is presumably a modified spinala or "eupathid". As its affinities are uncertain, it is here called, non-committally, a "sensifemorala" (Fig. 4 B, code SeFeII.95d). Similar setae upon genu II and femur IV are shown in Figs 4 B, C respectively.

Gnathosoma normal for family, as figured (Fig. 5). Palpal scobalae slender, pointed, ciliated, tectum setae not expanded.

Description of Nymph (Fig. 6 A-D) (from ACA1738, supplemented from ACA1739). Colour not recorded. Animal of normal nymphal smaridid build, with a short slender nasus and moderately sclerotized plates. Idiosoma 710μ long by 515μ wide (the specimen is somewhat swollen in the Hoyer's chloral hydrate medium used as a mountant).

Anterior dorsal scutum as figured, somewhat quadrangular with anterior projection on to the nasus, and with rounded angles, 310μ long by 215μ wide, enclosing the eyes and sensillary areas. There is a slight ocular projection of the scutum edge near the eye-bosses.

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is given since there is no suitable pair of setae in Fig. 4 to illustrate this principle) then a further specification would be necessary. The positions of setae T and U are represented diagrammatically in Fig. 4 A. Using seta T as an example, since calculating the radial coordinate from a slide specimen would require determining, e.g. the proportion MR/MN, it would be simpler to use such a proportion as the further coordinate (the proportion being specified as either across the a-p diameter of the section, or across the d-v diameter). Thus, if a = 0 and p = 1·00, we have for setae T and U the following coding:

T SeGeII.71pd(.76p),
U SeGeII.71d(.65p),

where the coordinates in brackets refer to the projection along MN (or NQ). It will be noted the code letter p is required within the brackets, since if the leg were lying flexed on its side on the slide, one would have to use the d-v projection.

If (e.g. in the case of seta T) we call the a-p distance x (a = 0, p = 1.00) (MR in Fig. 4 A) and the d-v distance (NS) y (d = 0, v = 1.00), we have, for a circular cross-section:

$$(x - \tfrac{1}{2})^2 + (\tfrac{1}{2} - y)^2 = (\tfrac{1}{2})^2.$$

Hence for $x = .76$, $y = .0729$,
and for $x = .65$, $y = .0231$.
Thus if the d-v projection is used the same setae T and U could be coded thus:

T SeGeII.71pd(.07v),
U SeGeII.71d(.02v).

(In the case where the limb transverse sections are markedly non-circular it would in general be best to specify coordinates in whatever is the more usual attitude for legs to assume on a slide. In the Smarididae there is a tendency for a leg to appear vertically compressed (i.e. height greater than width), at least in some segments, and thus it may be more convenient to use the d-v projection, particularly with detached legs on a slide.)

A similar convention can be used to code the type and position for the idiosomal setae. Thus, scobala W in Fig. 6 A may be coded as LScDo.76w(.66p). Here L = left of the median sagittal plane, Do = dorsal, .76w means that WK/DK = 0.76 (WK = z, DK = w), .66p means that AK/AP = 0.66 (AK = x, AP = p) (see Fig. 6 E). This coding could be abbreviated to LDo(.76, .66). A similar coding could be used for the ventral setae (Ve = ventral). It will be noted that in this convention the distance from the median sagittal plane is coded before the a-p coordinate. If the animal is regarded as having the a-p length as in a N-S direction, then D-E runs in a W-E direction. The code proposed thus follows the ordinary grid convention of placing "eastings" before "northings". It will be noted also that the same applies with the system proposed for the leg coordinates.

This idiosomal coding system is likely to be of most use where setae are numerous and are not capable of being specified clearly by relation to other structures, as happens with the idiosomalae of many of the Erythraeoidea and Trombidioidea, particularly in the 8-legged stages. To what extent these coordinates change during the duration of that instar from growth due to feeding is not clearly known, and will require further study.

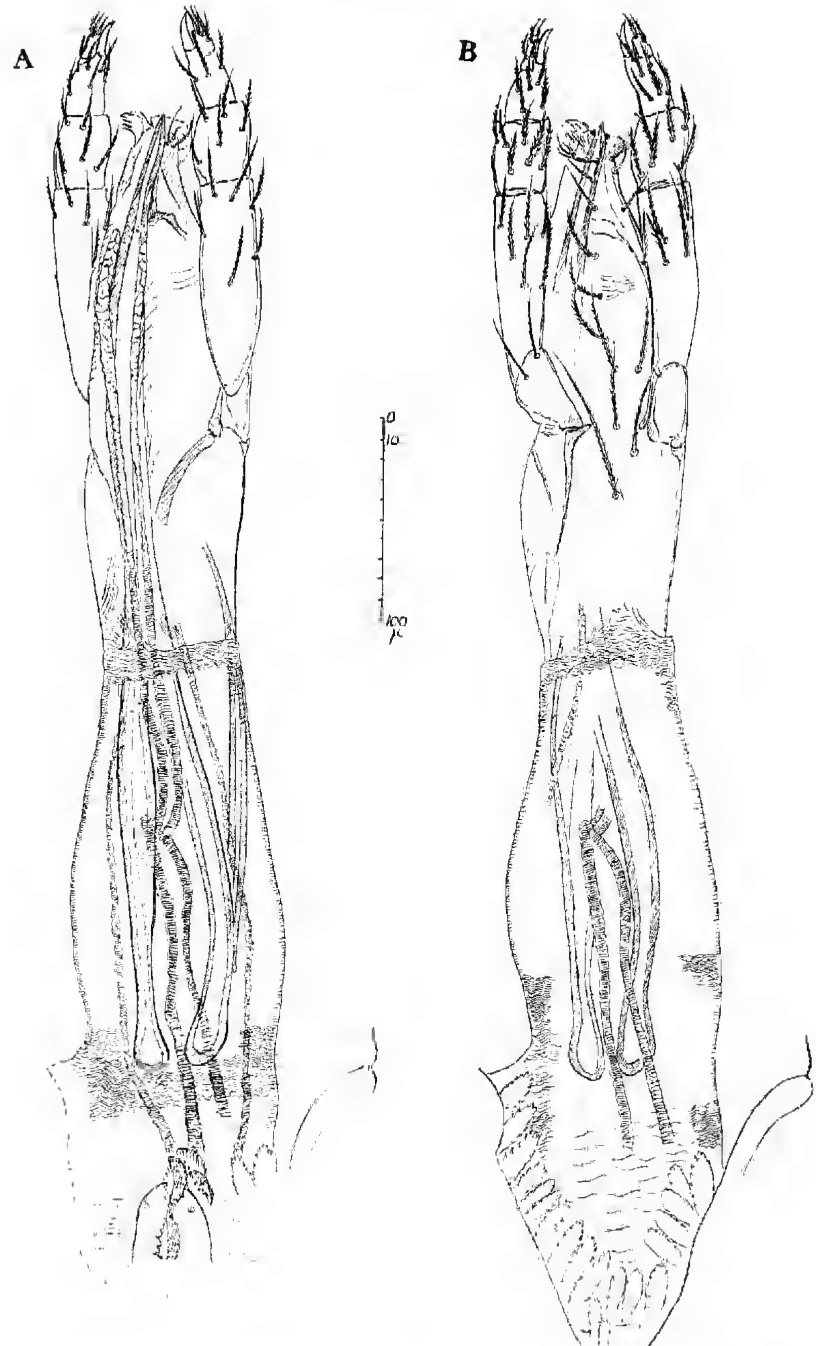

Fig. 5. *Smaris cooperi*, n. sp. Adult female (holotype). Gnathosoma, fully extended, showing details of internal structure. A, from above; B, from below.

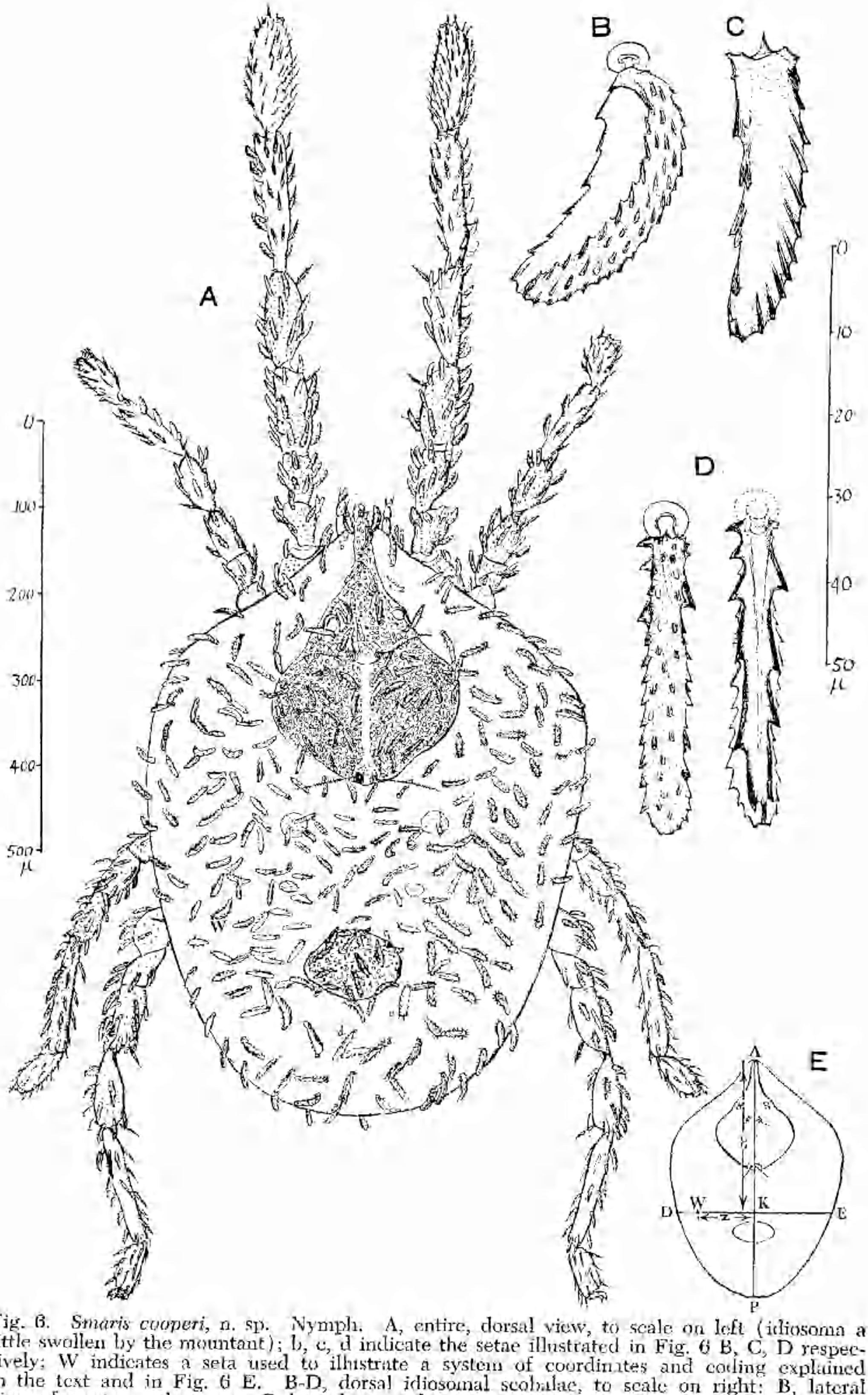

Fig. 6. *Smaris cooperi*, n. sp. Nymph. A, entire, dorsal view, to scale on left (idiosoma a little swollen by the mountant); b, c, d indicate the setae illustrated in Fig. 6 B, C, D respectively; W indicates a seta used to illustrate a system of coordinates and coding explained in the text and in Fig. 6 E. B-D, dorsal idiosomal scobalae, to scale on right: B, lateral view of a seta on the nasus; C, lateral view of a seta near posterior dorsal scutum; D, dorsal and ventral aspects (i.e. tectal and carinal) of a seta near the posterior dorsal scutum. E, diagram to explain convention of coding proposed for idiosomal setae (see text); W indicates seta W in Fig. 6 A.

Eyes 2 + 2, as described in adult; anterior 27μ across, posterior 20μ across. Ocular boss carries two normal dorsal scobalae.

Anterior sensillary boss lightly sclerotized, anterior sensillae as described for adult. Posterior sensillary boss lightly sclerotized, without scobalae, posterior sensillae as described for adult.

The anterior dorsal scutum has a reticular pattern made of small polygonal pits, except between the sensillary areas, and which thereby indicates a crista within the scutum. The scobalae of the anterior dorsal scutum originate from the sides of rather large circular or rounded-polygonal pits set among the smaller polygonal pits; the small pits are devoid of setae. The scutal scobalae are similar to the other dorsal idiosomal scobalae.

The standard data of the specimen (ACA1738) are:

ASens	PSens	SBa	SBp	ISD	DS
75	90	28	16	141	20-42

Posterior dorsal scutum small, lying transversely at junction of podosoma and opisthosoma, length 85μ, width 108μ, with reticular patterning from polygonal pits as in the anterior dorsal scutum, but without any unpatterned median strip, and in addition with normal dorsal scobalae arising from larger rounded pits as in the anterior scutum.

Dorsal idiosomal setae (scobalae) resemble those of adult but are less chitinized, the tectum setae (dorsal flange of seta) almost parallel-sided, slightly clavate and distally blunted, the spicules tending to be more irregularly distributed. The carinal flange is narrower than in the adult, parallel-sided but with 5-6 coarse serrations which project only a little beyond the tectum setae (Fig. 6 B-D). Idiosomalae fairly uniform in size over the dorsum, this statement referring also to the scutal scobalae.

Venter (from ACA1738 and ACA1739): the anterior ventral plate which normally encloses the fused lateral coxa I and II of each side tends to be divided. Ventralae similar to those of adult. Urvulva normal for nymphal erythraeoid. Anus normal.

Legs normal, similar to adult. Leg lengths (including trochanter and to tips of tarsal claws): I 630μ, II 405μ, III 415μ, IV 530μ. Tarsus I 125μ long by 41μ high; tibia I 154μ long; tarsus IV 73μ long by 26μ high; tibia IV 145μ long (tarsal lengths exclusive of claws and pedicles). Leg setae similar to those of adult, the pattern of specialized sensalae being simpler.

Gnathosoma normal (not much extruded in the specimens available for study). Palpal scobalae slender, pointed, ciliated. Tibial claw falciform, simple, fairly strong.

Localities: South Australia, two specimens: (1) Muston, Kangaroo Island, in moss (site near the post office), 23 August 1943 (extracted subsequently by Berlese funnel), H. M. Cooper; register number ACA1733, holotype, in South Australian Museum collection. (2) Hindmarsh Falls, in moss, 13-25 October 1951 (extracted by Berlese funnel), R. V. Southcott; ACA1734, paratype, in author's collection.

Western Australia: Warren National Park, in moss in karri (*Eucalyptus diversicolor* F. v. M.) and undershrub forest, 1 mile west of Pemberton, 26 November 1960 (extracted subsequently by Berlese funnel), P. F. Aitken, 3 specimens: one adult female (register number ACA1737) and two nymphs (register numbers ACA1738 and ACA1739), in South Australian Museum collection. Mr. Aitken reports (personal communication, 1961) that the moss was growing on rotting fallen tree-trunks in the dense wet sclerophyll forest.

Nomenclature: The species is dedicated to its original collector, Mr. H. M. Cooper, a meticulous student of the aboriginal archeology and white exploration of South Australia, particularly of Kangaroo Island, who has collected biological specimens including Acarina in various South Australian localities.

Smaris cooperi n. sp. was referred to earlier by the present author as "an undescribed species from South Australia" (Southcott, 1961b, p. 424, line 11). This was written before the Western Australian specimens had been collected.

THE SYSTEMATICS OF *SMARIS* IN AUSTRALIA

Smaris cooperi n. sp. is a striking species, there being no species with a comparable dorsal idiosomal scobala that the writer has seen among Australian, North and Central American or African members of the genus he has studied, nor has been described from these regions or from Europe. The species may be distinguished from the other Australian species, *S. prominens* (Banks, 1916) thus:

A. Adults

Dorsal idiosomal setae ovoid, blunted terminally, with the edge of the carinal flange (i.e. ventral plate of these setae) of seta divided into about 6 teeth which do not project beyond edge of tectum setae (dorsal flange); dorsal idiosomal setae 15-20μ long .... *S. prominens* (Banks)

Dorsal idiosomalae spindle-shaped or somewhat clavate, blunted terminally. Edge of carinal flange divided into 3 or 4 coarse serrations which project beyond edge of tectum setae. Dorsal setae more variable in size, 22-32μ long .... *S. cooperi* n. sp.

B. Nymphs

Dorsal idiosomal setae lanceolate in outline, distally tapering smoothly to a point; carinal flange narrow-lanceolate with regular serrations; not projecting beyond edge of tectum setae. Dorsal setae 18-20μ long .... *S. prominens* (Banks)

Dorsal idiosomal setae almost parallel-sided, the outline of the tectum setae slightly clavate, seta terminally blunted. Carinal flange broad, proximally as broad as tectum setae and with serrations, which in the proximal part of the seta project beyond the edge of the tectum setae. Dorsal setae 20-42μ long .... *S. cooperi* n. sp.

REMARKS ON THE DISTRIBUTION OF THE GENUS *SMARIS* IN AUSTRALIA

The genus *Smaris* is widely distributed, occurring in Europe, South Africa, North and Central America, Australia and possibly South America (Southcott, 1961b, 1962). Previously the only species known from Australia has been *Smaris prominens* (Banks, 1916), which is widely distributed in the eastern half of Australia, it being recorded by Womersley and Southcott (1941) from New South Wales, Victoria and South Australia, and by Southcott (1960, p. 159) from north Queensland. The description of *Smaris cooperi* n. sp. thus increases the known Australian species to two.

At the present time *Smaris cooperi* is known from only three localities recorded above, these being Kangaroo Island in South Australia and Hindmarsh Falls on the adjacent mainland, and from the south-western corner of Western Australia. Hindmarsh Falls are near the southern end of the Mt. Lofty Ranges, toward Encounter Bay, and a gap of only 9 miles separates Kangaroo Island from the mainland. It is believed that this gap, Backstairs Passage, has originated during recent (Tertiary) geological times (Campana *et al.*, 1954; Glaessner and Parkin, 1958), and thus from a distributional viewpoint, Kangaroo Island may be regarded as the continuation of the Mt. Lofty Ranges. However, it is probable that during the last glaciation at the end of the Pleistocene the sea-level sank with the world-wide regression and a land connection re-existed. With the passing of that epoch, about 10,000 years B.P., Kangaroo Island began again to be separated from the mainland (Tindale, 1957, p. 6).

Smaris prominens has not so far been recorded from Kangaroo Island, but so far collecting for this mite has been sporadic and not many records have been made for its localities of occurrence over the whole of Australia. The only locality which has been extensively surveyed for it is the Glen Osmond region near Adelaide, at the edge of the Mt. Lofty Ranges (see Womersley and Southcott, 1941). This species has also been recorded from the southern end of the Mt. Lofty Ranges, at Myponga and Encounter Bay (*loc. cit.*). Thus it is evident that, speaking broadly, the two species are sympatric at the southern end of the Mt. Lofty Ranges. Possibly wider distributions and more extensive overlapping will be revealed by further collecting.

Adults and nymphs of the Smarididae are predators on small insects and other arthropods, and are found in damp situations. Only a few larvae have been described, and of these only two species have been successfully correlated with the adult or nymphal stages by rearing in captivity, these species being *Smaris prominens* and *Sphaerotarsus leptopilus* Womersley and Southcott, 1941. *Smaris prominens* is the only species for which a suitable larval host is known; the larvae having been found to parasitize only small Psocoptera of the families Troctidae and Lepidopsocidae (see Womersley and Southcott (1941); Southcott (1960, 1961 a, b)). Neither the adults or nymphs of the Smarididae, nor the small Psocoptera so far found to be suitable larval hosts appear to be likely to be distributed by wind over any but short distances (many other insects have been examined for ectopararasitic larval Prostigmata by the author and others in Australia; no other hosts of larval Smarididae have been found). It must be admitted, however, that the possibility of wind distribution of smaridid mites cannot be entirely disregarded. Thus if a gravid female mite were in a suitable moist crack on a piece of bark on a eucalypt (such sites being favoured by these mites) it is by no means impossible that a piece of such bark could be stripped off and carried a considerable distance by a high wind, and the same could apply for the appropriate psocopteran hosts. Perhaps, however, too much should not be made of such a possibility, since if the transportation of fragments of eucalypts (such as are commonly the product of high winds, involving bark, leaves, blossoms and fruit) were of any great significance one might reasonably expect to find a very scattered distribution of eucalypt species, particularly those with small fruits and leaves and with a tall habit.

The sharp division between much of the flora and fauna of the western and eastern halves of the Australian continent is noteworthy, this applying not only to plants that are unlikely to be spread by wind-distribution and purely terrestrial animals, but applies also to e.g. a number of flying insects which would appear to be capable of being transported by winds over considerable distances, and for which a suitable food-supply is available. The works of Cross (1954, 1955, 1957), Crocker and Wood (1947), and Mackerras (1960) may be instanced as discussing the isolating mechanisms which have occurred with various of the Australian flora and fauna.

It is not at present known at what geological period the family Smarididae originated, or the genus *Smaris* or its species. Apart from a number of erythraeoid mites described from the Baltic amber (Oligocene) the only fossil erythraeoid is a larval mite from the Cretaceous amber of Canada, not ideal for description, and referred to briefly by Ewing (1937). The position of that mite within the Erythraeoidea is not known; it is discussed by the author elsewhere (1961b). Some of the erythraeoid mites are ectoparasitic in the larval stage upon scorpions and other arachnids, but the majority are ectoparasites upon insects, the relations in some cases being suggestive of host-specificity, but not in others (see Southcott (1946b; 1961a, p. 174)).

The finding of a new species of *Smaris*, *S. cooperi*, in Western Australia and South Australia, indicates therefore a link between the faunas of those two regions. Little or no collecting has been done for Acarina over the arid zone between these regions. However, since Smarididae usually favour damp situations it would appear likely that the distribution of *S. cooperi* is discontinuous. Various examples could be quoted which suggest a link between the terrestrial faunas of the south-western corner of Western Australia and, for example, Kangaroo Island. The author is indebted to Mr. B. C. Cotton for pointing out that the Australian land snail genus *Bothriembryon* Pilsbry, 1894, has many species in the south-west of Western Australia, one extending across the Nullarbor Plain. The only other recorded distribution of that genus is (Cotton, 1957, pp. 123-4; 1959, p. 415 (personal communication, 1961)) of two species (*B. angasianus* Pfeiffer, 1864, on Eyre Peninsula, and *B. mastersi* Cox, 1867, on Eyre and Yorke Peninsulas, South Australia, *B. spenceri* Tate, 1894, from Central Australia, and a further species, *B. decresiensis* Cotton, 1940, from Kangaroo Island. Since these are dry-land forms, it would appear that the possible distribution of the genus by, for example, eggs or juveniles in mud on the feet of water-birds, is unlikely. Thus, *B. decresiensis* was originally found in dry situations upon the cliff-tops at Cape Cassini, Kangaroo Island, by its collector, Mr. H. M. Cooper (H. M. Cooper, personal communication, 1961) at the archeological camp-site recorded by Cooper (1960, p. 488).

Many other instances of links between the south-west of Western Australia and Kangaroo Island and the adjacent mainland of South Australia could be given. The position with regard to the flora is discussed in Crocker and Wood (1947). Earlier Wood (1930, p. 127) had concluded:

> "The flora of this Gulf Region [of South Australia] is composed almost equally of migrant species from the western and eastern centres of distribution in Australia, together with 82 endemic species out of a total of 657 species. The migration from the west was earlier than migration from the east; and the Southland, represented at present by Kangaroo Island and the sunklands of the gulfs, formed the chief means of passage through which the species of westerly origin passed. The migration of species from the eastern centre occurred chiefly after the separation of the Eyre Peninsula, and the gulfs have proved a barrier to westerly migration of these species."

Similarly, we may expect that many of the affinities of the terrestrial fauna of Kangaroo Island will be with the adjacent South Australian mainland and the eastern part of the Australian continent. To quote a single instance within the author's experience we may refer to the scorpion *Urodacus abruptus* Pocock, 1888. This species is recorded by Glauert (1925) and Southcott (1955) from Kangaroo Island, and on the Australian mainland extends from South Australia through Victoria and New South Wales. In south-western Australia the related *Urodacus novaehollandiae* Peters, 1861, replaces it, and this species extends as far east as Eucla (Glauert, 1925). This genus of scorpions (*Urodacus* Peters, 1861) consist of burrowing species only, and it may be accepted they have migrated solely along land-bridges. Even at the present time the possibility of long transportation of members of this genus by human agency in sand or soil appears very small.

It may be concluded that the distributions of *Smaris cooperi* and *Smaris prominens* in Australia, as far as they are at present known, are consistent with the viewpoint that *S. cooperi* could represent a species distributed from the south-western corner of the continent, and that *S. prominens* could represent a species distributed from a centre in the eastern half of the continent.

DESCRIPTION OF A NEW SPECIES OF *FESSONIA*

Fessonia taylori n. sp.

Figs. 7-10

Description of adult (probably female) (Figs. 7, 8) (from the holotype ACA1735). Colour in life reddish. Animal of normal smaridid shape and with a short nasus. Idiosoma 875μ long to tip of nasus by 485μ wide where widest.

Crista normal for genus, the anterior sensillae placed 235μ behind the nasus and just posterior to the eyes. The standard data are:

ASens	PSens	SBa	SBp	ISD	DS
65	62	26	26	198	20-41

Anterior sensillae slender, lightly ciliated throughout, ciliations longer in distal half of seta; posterior sensillae similar.

Eyes 2 + 2, the anterior the larger, 32μ across, posterior 24μ across and placed a little lateral to the anterior eye.

Dorsal idiosomalae (scobalae) brown, oval to clavate, blunted terminally, the longest setae being near the tip of the nasus or at the posterior pole of the idiosoma, and in these longest setae the widest point of the tectum setae is more than 3/4 along the length of the seta. Tectum setae with 4-6 columns of coarse serrations or spicules, these not linked to each other, with their two median columns usually regular, the other columns may be somewhat less regular. Spicules about 28-40 in number over tectum setae. Carinal flange narrow, its lateral edge with about 10-12 pointed strong ciliations.

Venter normal. The more peripheral ventral setae resemble the dorsal scobalae, but are rather simplified (Fig. 7 F, G) while the more central scobalae are the usual central ventral smaridid scobalae, with a compact centre from which arise long bushy ciliations (Fig. 7 H, I). Internal genitalia not clearly seen, but appear to be of female type.

Legs of normal size and shape for the genus. Leg lengths (including trochanter to tip of tarsal claws), I 1140μ, II 640μ, III 690μ, IV 1030μ. Tarsus I 185μ long by 68μ high, tibia I 255μ long, tarsus IV 140μ long by 41μ high, tibia IV 270μ long. (Tarsal lengths exclude claws and pedicle.) Tarsal claws normal, ciliated obliquely along their sides.

Setation of legs in general similar to that of *Smaris*. Pedoscobalae (except distally on tibiae and tarsi) similar to the idiosomalae, but tend to be more slender, as is usually the case in the Erythraeoidea. Also as is usual in the Erythraeoidea the annulus or seta-base of the pedoscobala is set in a small ovoid depression; a number of these are illustrated in Fig. 7 J. The middle segments of the legs carry normal Trombidiformes-type spinalae, as in *Smaris*. Several such are shown in Fig. 7 J on genu IV and tibia IV and one such is coded as SpGeIV.68d.* In addition to the spinalae the legs carry some ciliated sensalae. Some of these are illustrated in Fig. 7 J, two being shown upon telofemur IV and coded as SeFeIV.90d and SeFeIV.95d, and others upon the genu IV are shown, these latter being coded as SeGeIV.46pd, SeGeIV.48pd, SeGeIV.84pd and SeGeIV.94d.

* See the explanation of the coding system earlier in the present paper.

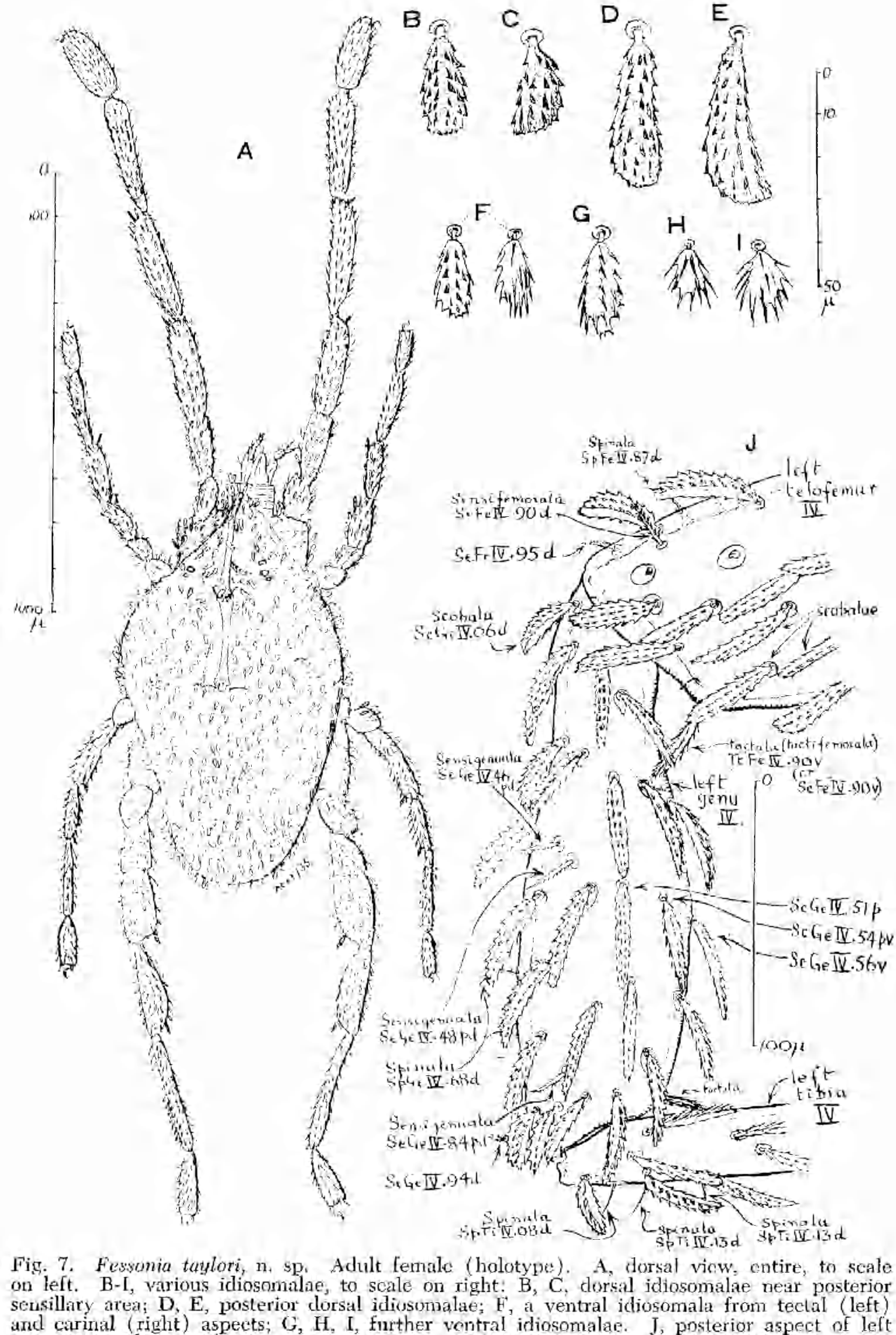

Fig. 7. *Fessonia taylori*, n. sp. Adult female (holotype). A, dorsal view, entire, to scale on left. B-I, various idiosomalae, to scale on right: B, C, dorsal idiosomalae near posterior sensillary area; D, E, posterior dorsal idiosomalae; F, a ventral idiosomala from tectal (left) and carinal (right) aspects; G, H, I, further ventral idiosomalae. J, posterior aspect of left genu IV, and part of telofemur IV and tibia IV, to show features of chaetotaxy (see in text for explanation of chaetotaxic coding) (to scale on right).

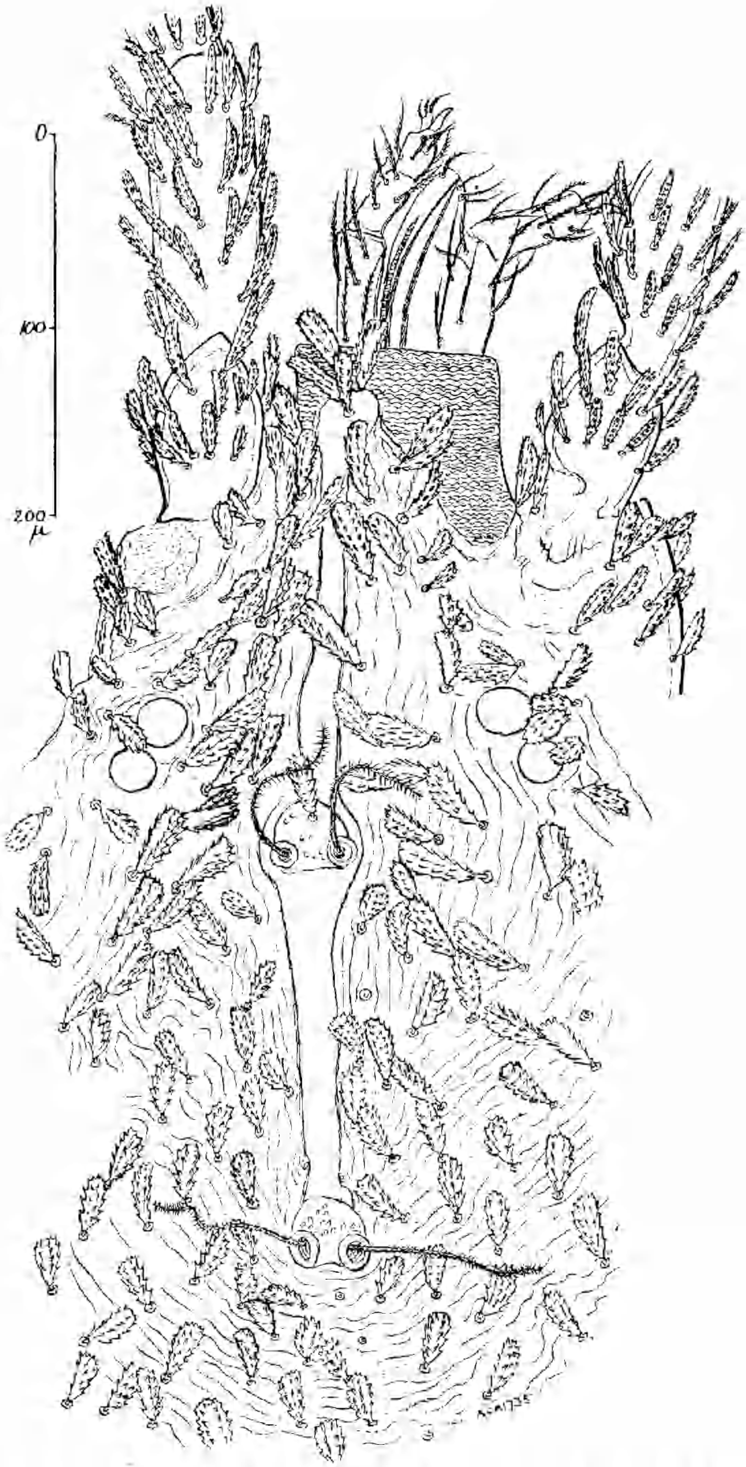

Fig. 8. *Fessonia taylori*, n. sp. Adult, holotype. Dorsal view of propodosoma showing crista, mouthparts, and adjacent structures.

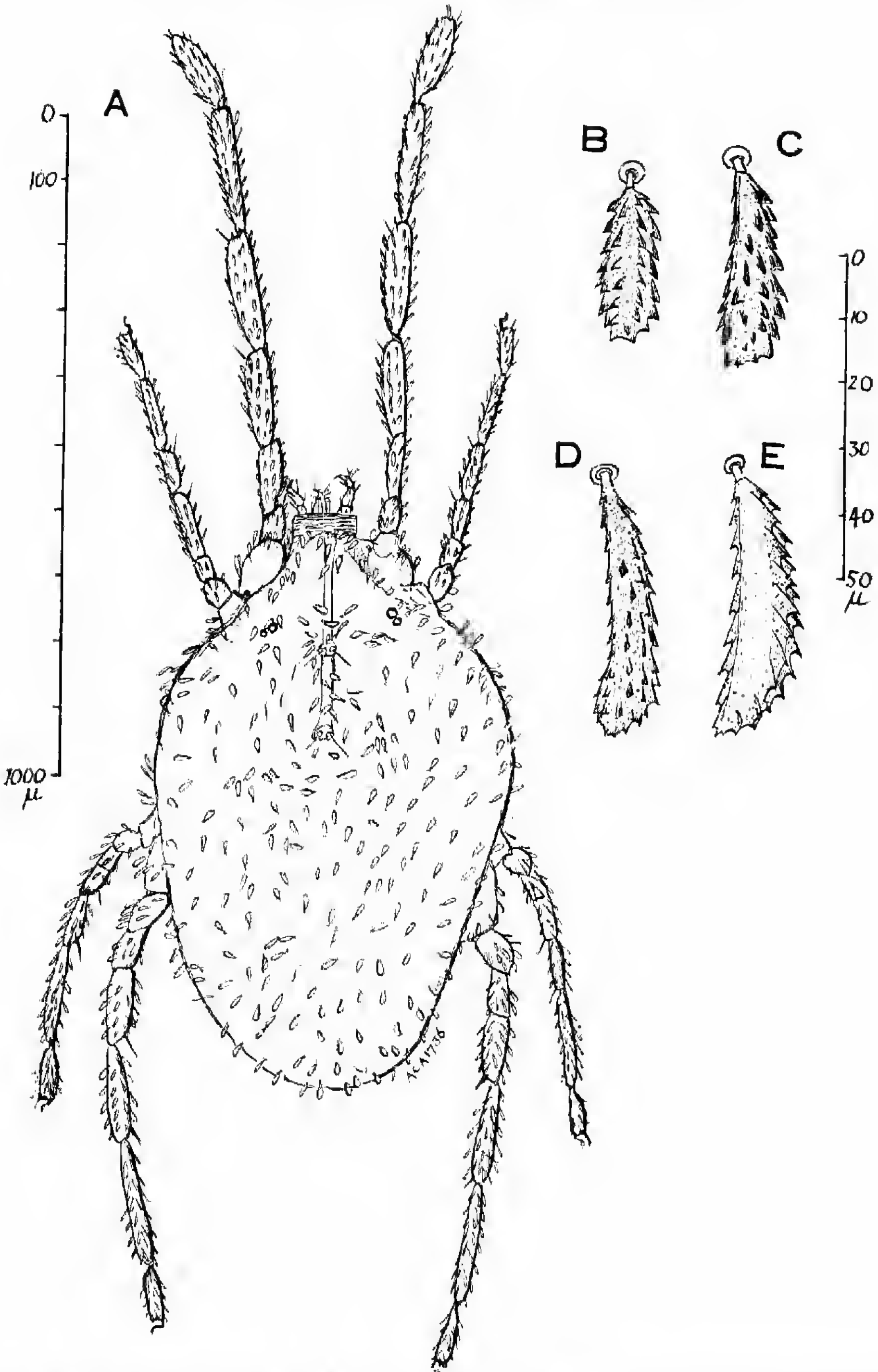

Fig. 9. *Fessonia taylori*, n. sp. Nymph. A, dorsal view, entire, to scale on left. B-E, dorsal idiosomal setae, to scale on right: B, C, two setae near posterior sensillary area; D, E, two setae near posterior pole of idiosoma.

Gnathosoma normal, as figured (Fig. 8). Palpal scobalae slender, ciliated.

Description of nymph (Figs. 9, 10) (from ACA1736). Colour in life reddish. Animal similar to adult but smaller and of more slender proportions. (The specimen studied has the idiosoma somewhat swollen by the polyvinyl alcohol-lactophenol mountant used.) Idiosoma 795μ long to tip of nasus, by 515μ wide. Crista normal for genus, ASens placed 160μ behind tip of nasus. Standard data are:

ASens	PSens	SBa	SBp	ISD	DS
56	83	16	20	121	18-42

Sensillae similar to adult.

Eyes similar to adult, anterior 22μ across, posterior 16μ across.

Dorsal idiosomal scobalae similar to those of adult, but tending to be more slender.

Venter appears normal, but not clearly seen in the preparation, which is dorsum uppermost.

Legs normal, of the usual slender nymphal smaridid proportions. Leg lengths (including trochanter to tip of tarsal claws) I 800μ, II 430μ, III 440μ, IV 700μ. Tarsus I 128μ long by 41μ high, tibia I 185μ long, tarsus IV 96μ long by 32μ high, tibia IV 185μ long (tarsus measured without claws or pedicle). Tarsal claws as for adult.

Gnathosoma normal, similar to adult. Palp and setation as described for adult.

Locality: National Park, Audley, New South Wales, 12 September, 1943, under leaf litter on damp soil in eucalypt forest along south bank of Kangaroo Creek, one adult (ACA1735) and one nymph (ACA1736) (R. V. Southcott).

Remarks on Nomenclature: This new species is dedicated to the late Mr. F. H. Taylor, 1886-1945, formerly Entomologist, School of Public Health and Tropical Medicine, Department of Health, Commonwealth of Australia, and University of Sydney, in gratitude for encouragement and many kindnesses.

THE SYSTEMATICS OF *FESSONIA* IN AUSTRALIA

Fessonia taylori n. sp. is quite distinct from the only other Australian *Fessonia* that has been described, *F. australiensis* Southcott, 1946, the latter known from the adult only. The adults of these two species may be separated by the following key:

Dorsal idiosomalae lanceolate-clavate, mostly with the widest point of the tectum setae about 2/3 along seta; with 6-8 well-defined regular columns of linked pointed spicules over the proximal 2/3 of the tectum, these columns then tending to break up more distally, being in the distal 1/3 of the tectum short, blunted and irregularly arranged, unlinked. Posterior dorsal scobalae 18-33μ long. Palpal scobalae elongate-lanceolate, ciliated .... *F. australiensis* Southcott, 1946.

Dorsal idiosomalae clavate, blunted, and in the more posterior setae, which are the more clavate, the widest point of the tectum setae is more than 3/4 along the seta. Tectum setae with 4-6 columns of coarse (serrate) spicules, not linked to each other, and of which the two median columns are usually regular, the more lateral columns tending to be less regular. Dorsal scobalae 20-41μ long. Palpal scobalae slender, ciliated .... *F. taylori* n. sp.

No attempt to key the nymphs will be made here as the nymph of *F. australiensis* has not as yet been observed from Australia.

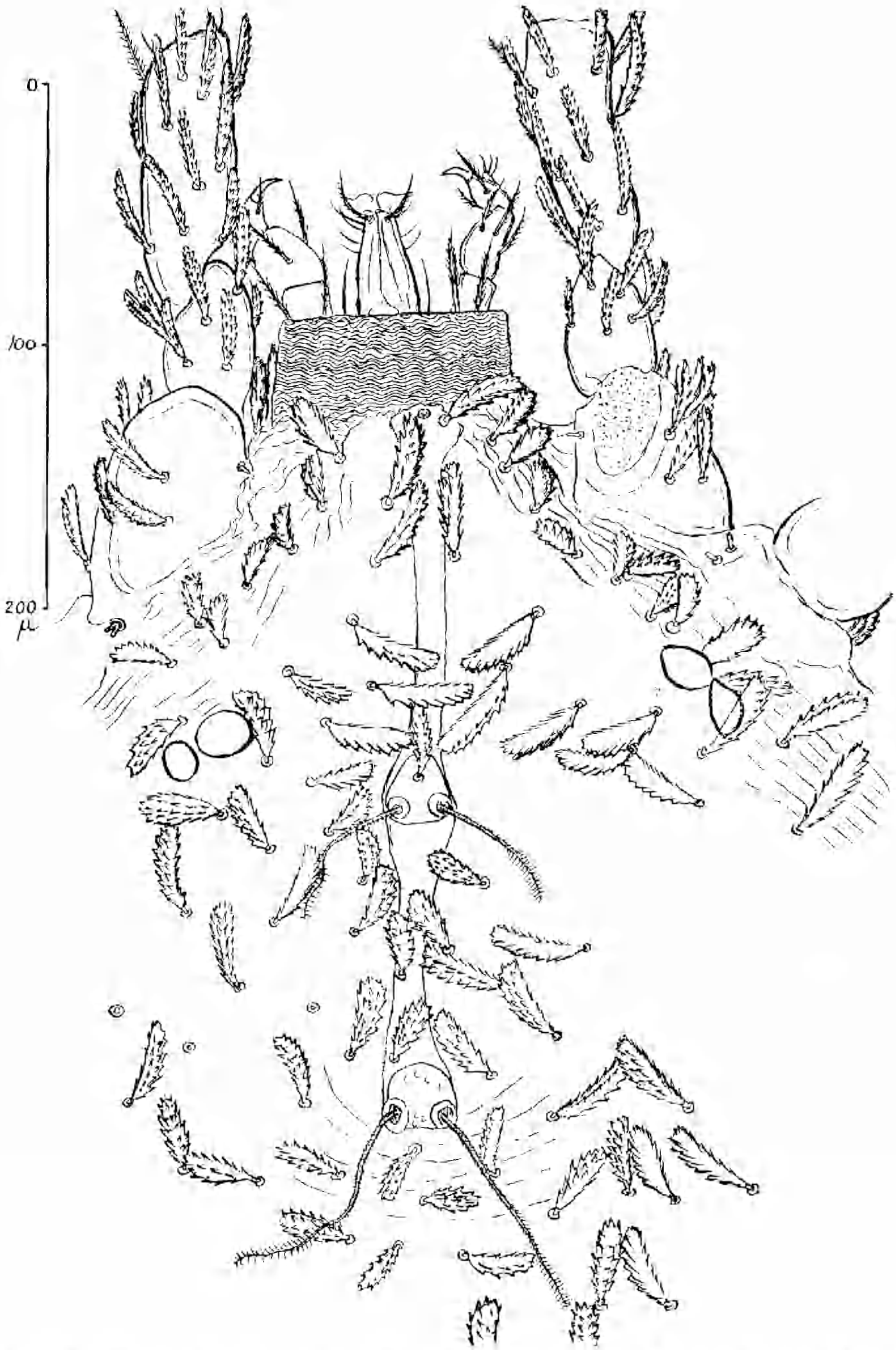

Fig. 10. *Fessonia taylori*, n. sp. Nymph. Dorsal view of propodosoma, showing crista, mouthparts, and adjacent structures.

A NOTE ON THE GEOGRAPHICAL DISTRIBUTION OF *FESSONIA AUSTRALIENSIS*

The type locality of *F. australiensis* was Mataranka, Northern Territory (see Southcott, 1946). The author has also in his collection an adult specimen of *F. australiensis* collected at Montalbion, Irvinebank, north Queensland, in litter and soil at base of *Eucalyptus* sp., at the edge of a large dam, 11 October, 1944 (R. V. Southcott). The author has also seen specimens of this species from India, Burma, China and Mexico from other collections, which will be recorded further elsewhere.

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* Contains a full bibliography of the family.